

Nutrition for Nurses

Nutrition and Human Welfare

By

Rajammal P. Devadass, M.Sc., M.A., Ph.D.

Mineral Elements

In the preceding chapters, we discussed the composition and nutritive function of foods in terms of the organic nutrients—carbohydrates, fats and proteins. They are composed of the elements, carbon, hydrogen, oxygen, and nitrogen, which form a prominent part of the body's structure. In addition to the above, there are other chemical elements, regularly found in the body, present in small quantities, but essential to normal life. They are known as mineral elements, inorganic food stuffs or mineral salts. The presence of about 30 elements is known in the body. Out of these, some 11 elements are regarded as absolutely essential for the proper functioning of the body. They are: Calcium, Phosphorus, Potassium, Sodium, Magnesium, Iron, Manganese, Copper, Iodine, Cobalt and Zinc. Oxygen forms 65% of the body, Carbon 18%, Hydrogen 10% and Nitrogen 3%.

With regard to the question whether other elements are essential, it is clear that a diet adequate in the 13 essential elements will almost certainly provide the other elements also.

The minerals enter into the composition of many structures in the body and regulate several physiological processes. They take part in the functions of the body at least in three ways:

1. As constituents of the mineral matter of the bones and teeth, giving these structures strength, rigidity and permanence, calcium, phosphorus and magnesium take part in this function.
2. As constituents of the soft tissues, sulphur in tissue proteins,

phosphorus in cell structure, and iron in red blood cells.

3. As constituents of substances concerned in regulatory functions, the salts held in solution in the body fluids give their characteristic influence upon the functional capacities of muscles and nerves; their ability to transport nutrients and metabolites, property for acidity or alkalinity of the digestive juice and power to maintain the approximate neutrality in the blood and body tissues. Sodium, potassium, calcium and chlorine are mostly responsible for these functions.

In addition to the minerals mentioned in the above three functions, there are others with special purposes e. g., (a) Iodine is a constituent of the thyroid gland, which controls the rate at which energy is used up in maintaining the body processes. Iodine is needed only in a very minute quantity but that minute quantity is very essential. In its absence, retardation of growth and cretinism result in the young, while hypothyroidism occurs in the adults. Iodine is derived from drinking water, sea fish, oysters and vegetables grown on soils containing iodine; (b) copper is needed together with iron for the formation of red blood cells; (c) Manganese plays a part in the gradual release of energy from foods and (d) Cobalt is found in the antipernicious anemia factor, vitamin B in the liver. These are called 'trace elements' because they are needed only in traces and are widely distributed in many foods.

All the body fluids contain 9% of sodium chloride, which is very important

for life. Muscular cramps are caused if there is a shortage of salt. Salt is lost from the body through urine and sweat.

Calcium, Phosphorus and Iron

Calcium

There is more calcium in the body than any other mineral. The bulk of calcium is in the bones and teeth in combination with phosphorus. Calcium is necessary for the normal clotting of the blood, and for the normal functioning of the muscles. Decreased calcium in blood leads to increased excitability of the muscles, resulting in tetany. Calcium is also needed for the contraction of heart muscle, while potassium favours its relaxation. Growth of children will be retarded if adequate amounts of calcium are not given in their diet. Unless sufficient calcium salt is deposited in the growing bones, bones fail to be rigid and easily bend, developing rickets. Vitamin D is essential for the absorption of calcium from the intestines and for the deposition of calcium phosphates in the bone. Another factor important in the proper absorption of calcium is the ratio between calcium and phosphorus in the diet. The calcium/phosphorus ratio is 1:1.5 or 2. When the diet does not supply enough calcium, the calcium in the bones is withdrawn into the blood. Excess of acid in the diet, acidosis, hyperthyroidism, hyperparathyroidism and the medicinal preparation "A.T.10", all take away the calcium from the bones. If this loss is not replaced, refraction of bones results, predisposing to fracture, osteoporosis and osteomalacia. Optimum amounts of calcium in the diet ensure maximum vitality, length of life and the vigour of the off-spring through successive generations. Therefore liberal amounts of calcium must be included in the daily diet.

Food Sources :

Milk makes the best contribution of calcium in the daily diet. Among cereals, ragi is the best source. Leafy vegetables, egg yolk, bones of animals and fish are excellent foods for calcium.

The daily requirement of calcium

varies according to age and stage of growth. Children need about 1 gram every day, adolescents 1.5 gram and adults same as children. Pregnant and lactating women need 1.5 and 2 grams respectively. Calcium deficiency is one of the crucial deficiencies of most Indian diets. Therefore every effort should be made to include calcium containing foods every day in the daily diets.

Phosphorus

Phosphorus aids in building the bones and teeth along with calcium and vitamin D. Phosphorus forms a part of the structure of every living cell and plays an important role in the complex reactions by which energy is released from food for the body. Phosphorus also helps in maintaining the constancy of the composition of body fluids necessary for the continuance of life.

Food Sources of Phosphorus

Fish, cheese, eggs, milk, meat, whole cereals, green leafy vegetables, legumes and nuts.

The requirement for phosphorus is $1\frac{1}{2}$ or 2 times that of calcium in the daily diet.

Iron

Iron gives the blood its red colour. 70% of the iron in the body is present as haemoglobin in blood. A considerable amount of iron is stored in the liver, kidneys and the spleen. Iron is also found in the tissues as part of compounds like cytochrome which is essential for tissue oxidation.

Meals need only minimal quantities of iron except under special circumstances such as accidents and long continued haemorrhages. Females need to replenish their stores continually. During pregnancy there is a constant drain on these stores because the mother supplies iron to the foetus. As children and adolescents experience continuous growth, their blood volume increases proportionally, thus raising the needs for iron.

The new born full term infant comes with a reserve of iron in its liver and makes use of it for a limited time up to 6

(Contd. on page 167)